Surplus Value Production and Realization in Marxian Theory – Applications to the U.S., 1987-2015

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Abstract

This paper highlights the separation between surplus value production and realization in Marx's work. A new method of estimating surplus value production at the industry level is proposed and implemented. Marx's procedure of transforming labor values into prices of production shows that capitalist competition to equalize the profit rate entails transfers of surplus value across industries, thus differentials between surplus value created and surplus value realized as profit can exist at the industry level. These types of transfers can also exist between productive and unproductive activities in the circuit of capital. First, to trace out these transfers, a framework linking money value added to surplus value production by industry is established. Second, data on value added by industry for the U.S. are used to estimate surplus value production at the industry level. The analysis allows comparison of surplus value production and realization in each industry. The pattern of differentials between surplus value creation and realization across industries points to a potential source of instability for capitalist economies.

Keywords: Circuit of Capital; Labor Theory of Value; Productive and Unproductive Labor; Surplus Value; Transfers of Surplus Value.

JEL Classification Numbers: B5, B51, E11.

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1 Introduction

Marx's original work of *Capital* raises the potential for a disconnect between surplus value production and its realization over the course of circulation. Surplus value can be produced in one industry yet wind up being realized as profit (and possibly revenue) by other industries. This amounts to a transfer of surplus value across industries and points to a need to understand surplus value production and its realization as separate parts of the circulation of capital and commodities. Understanding the separation of surplus value at the point of production and the point of realization can provide insight into how capitalist competition induces transfers of surplus value across industries, and the implications of such transfers.

This understanding requires careful attention to Marx's (1981) presentation of the equalization of the profit rate in volume three of *Capital*, and to his concept of unproductive labor. The concept of unproductive labor, in particular, is important for seeing how certain activities in the economy do not create value and are paid for out of surplus value. Recent contributions by Basu and Foley (2013), Foley (2011b), Paitaridis and Tsoulfidis (2012), and Mohun (2013, 2014) show that a concept of unproductive labor can be empirically meaningful for Marxian analyses of trends in the U.S. economy. These contributions, while relevant to the analysis of this paper, do not pay explicit attention to understanding transfers of surplus value from productive to unproductive industries. If one accepts Marx's assertion that unproductive activities are paid for out of surplus value, there must be some mechanism or series of channels through which surplus value created by productive activities is transferred to unproductive activities. Foley (2013) discusses how these transfers can take place through competition between industrial and financial capitalists, but the presentation is theoretical and an empirical account of surplus value transfers could shed light on important features of the circulation of capital and commodities.

This paper develops such an empirical account of transfers of surplus value using a new method of imputing surplus value production at the industry level. This is done by first building a framework to highlight the disconnect between surplus value production and realization. Surplus value production at the industry level is estimated using readily available data on GDP by industry and compared to surplus value realized across industries. It is shown that gaps between surplus value production and realization at the industry level are explained by the existence of transfers of surplus value across industries via capitalist competition. The pattern of these transfers in recent decades points to a potential source of economic instability that is worth further consideration.

The paper is structured as follows. The theoretical motivation and approach is detailed in Section 2. Section 3 discusses the empirical estimation of surplus value production at the industry level. Section 4 presents the results of the empirical estimates of surplus value production and realization, including trends in surplus value transfers over recent decades. Section 5 analyzes and discusses the results of Section 4 in light of recent literature. Section 6 provides some concluding remarks and discusses avenues for future work.

2   Surplus Value Production versus Realization

To develop a framework for understanding the disconnect between surplus value production and realization it is first helpful to establish some definitions and principles that will be used throughout the paper.

First, this paper accepts the so-called 'New Interpretation' (NI) of Marx (Duménil 1980, 1984; Foley 1982, 1986; Mohun 1994, 2004), and the analysis herein can be seen as an extension of prior work in the NI. The NI treats the conservation of aggregate value added across the circuit of capital as a basic principle of the labor theory of value (LTV). In the NI there is also a direct connection between money value added and the expenditure of labor time. The relationship between money value added and labor time can be summarized in the Monetary Expression of Labor Time (MELT), which allows one to covert between magnitudes measured in money and those measured in units of labor time (Foley 2005, 2011a; Mohun 2004). The conservation of value added and the MELT will be relied upon in developing the framework and analysis below.

The terms *aggregate value added* and *money value added* refer to new value created through commodity production. This value added is composed of wages and money surplus value. Wages reflect what workers require to reproduce themselves and *money surplus value* is the money value added produced by workers beyond their wages. The existence of this surplus indicates that workers, on the whole, are exploited. The NI takes wages as the money form of the *value of labor power*, where the MELT, which has the units dollars of value added per hour of labor time, can be used to convert between wages and the value of labor power (measured in hours of labor time). A similar conversion can be performed on money surplus value to convert it to *surplus value* measured in units of labor time. Lastly, the ratio of money surplus value to wages, or of surplus value to the value of labor power, yields the *rate of surplus value*, which provides an indicator of the degree of exploitation of workers. Marx uses the terms 'rate of surplus value' and *rate of exploitation* interchangeably, however for clarity, the former will be used throughout the paper.

It also worth mentioning Marx's definitions of a 'commodity' and 'value'. For Marx (1976), a *commodity* is something that possesses use value and exchange value, is the product of human labor, and is produced in order to be exchanged—and, in capitalist economies, exchanged for a profit. Labor taking place under capitalist social relations takes the form of a commodity, but this need not be the case for all labor. Labor that occurs in households, for instance, does not take on the commodity-form and does not possess value. Similarly, labor dedicated to activities that are not directly involved in commodity production does not create value, even if it takes place under capitalist social relations.

The term 'value' in Marxian analyses is potentially wrought with confusion given its multiple uses over a vast literature. For Marx, the 'value' of a commodity is the socially necessary abstract labor time required for its production, for clarity we call this a commodity's *labor value*. In Marx's analysis the labor value of a commodity has three constituent elements, all of which are measured in units of labor time: *constant capital*, raw materials used up in a production process; *variable capital*, the direct, or living, labor time required to produce a commodity; and surplus value. Marx makes clear that in capitalist economies commodities take on the form of labor values, and the many different commodities find a common expression in money (Marx 1976, 188), hence the link between labor time and money value in the

NI.

These ideas and terms will be used in developing the framework to examine surplus value production and its realization below. The potential disconnect between the production of surplus value and its realization shows up in two areas of Marx's work. One area is in his presentation of the transformation of labor values into prices of production, where capitalist competition redistributes surplus value across industries to equalize the profit rate. The other is in his discussion of unproductive activities in the context of the circuit of capital, where certain activities necessary for the circulation of commodities and social reproduction are paid for out of surplus value. These two strands of thought will be addressed in turn and then linked to develop a complete account of the transfers of surplus value taking place across its production and realization.

2.1 Competition and Surplus Value Production

In volume one of *Capital* Marx operates under the assumption that the labor values of commodities correspond to their prices. The correspondence between labor values and prices is lost in volume three of *Capital* when Marx (1981) allows for equalization of the profit rate via capitalist competition. Marx illustrates this disconnect between labor values and prices using tables, which are adapted below in Table 1 to highlight the production and realization of surplus value.

Table 1: Adaptation of Marx's (1981, Ch. 9) Tables for Profit Rate Equalization

(i) Industry	(ii) Constant Capital	(iii) Variable Capital	(iv) Rate of Surplus Value	(v) Surplus Value	(vi) Labor Value	(vii) Profit	(viii) Price of Production	(ix) Rate of Profit
1	80	20	100%	20	120	22	122	22%
2	70	30	100%	30	130	22	122	22%
3	60	40	100%	40	140	22	122	22%
4	85	15	100%	15	115	22	122	22%
5	95	5	100%	5	105	22	122	22%
Total	390	110		110	610	110	610	

Columns (ii)-(vi) of Table 1 show that industries with the same capital outlay (the sum of constant and variable capital) can produce different amounts of value depending on the rate of surplus value. As seen in column (vi) of Table 1, the labor value of the output of each industry is different. If the rate of profit were calculated according to the surplus value produced in each industry, $\frac{\text{Surplus Value}}{\text{Constant Capital}+\text{Variable Capital}}$, different industries would exhibit different rates of profit. However, Marx accepts the classical notion of competition and the tendential equalization of the profit rate from Smith (2000) and Ricardo (1951), thus this cannot be the case. Marx recognizes that competition among capitalists redistributes surplus value across industries in order to establish a uniform profit rate (Marx 1981, 297-298). The prices formed by profit rate equalization are called *prices of production*. The profit of each industry, prices of production, and the uniform rate of profit can be seen in columns (vii)-(ix) of Table

1. In column (ix) the rate of profit is calculated as $\frac{\text{Profit}}{\text{Constant Capital+Variable Capital}}$ and is uniform across industries.

Marx's presentation of the conversion of labor values into prices of production set off the well-known debates of the transformation problem, which revolve around the disconnect between labor values and prices of production immediately apparent in Table 1. If prices of production are the relevant prices to consider when analyzing capitalist economies (Marx 1981, 257, 280), then what, if any, relevance do labor values have? The fact that prices no longer correspond to underlying labor values leads some to reject a role for labor values and the LTV altogether (see Samuelson (1970, 1971, 1974) and Steedman (1977) for examples).

Other approaches find a concept of labor values and a LTV to be worthwhile. For instance, Chilcote (2004), Ochoa (1989), Shaikh (1998, 2016), and Shaikh and Tonak (1994) find that empirical estimates of labor values are close to market prices. Thus labor values are not meaningless and a LTV bears relevant insights for capitalist economies. The NI described above pays close attention to Marx's discussion of money being the form that value takes in capitalist economies. The NI's proposed MELT allows conversion between price and value magnitudes, which means that, for example, value magnitudes like surplus value and the value of labor-power can be recovered from data on profits and wages, rather than values being defined prior to prices, as in many approaches.[1] The approach of Flaschel (1983) and Flaschel, Franke, and Veneziani (2013) finds that a notion of labor values conceptually similar to the NI serves as a more reliable indicator of changes in labor productivity than standard measurements. This approach also finds that that technical progress induces a downward trend in the labor content of commodities—what Flaschel et al. (2013) call the 'law of decreasing labor content'.[2]

Many of the finer points of the transformation problem and LTV are beyond the scope of this paper. Helpful summaries can be found in Foley (2000), Moseley (2011a), and Mohun and Veneziani (2017). Table 1 shows the basic issues of the transformation debates, but more importantly for the current analysis, it highlights one way that transfer of surplus value can exist in capitalist economies. In Table 1 surplus value produced by the relatively labor-intensive industries—those with higher variable capital relative to the average—is transferred to relatively capital-intensive industries through the process of competition and profit rate equalization. This is an example of where there is a potential disconnect between surplus value production and its realization, and where an account of such transfers can shed light on surplus value production.

2.2 Surplus Value and Unproductive Labor

The other area of Marx's work in which transfers of surplus value appear is in the discussion of unproductive activities in the circuit of capital. Marx's circuit of capital highlights the conservation of value added over the phases of circulation, and locates the source of value—be

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[1]An approach related to the NI by Kliman and McGlone (1999) and many contributors to the volume by Freeman and Carchedi (1996) is known as the 'Temporal Single System Interpretation' (TSSI). Critical assessments casting doubt on the validity of the TSSI can be found in Mohun (2003), Mohun and Veneziani (2007, 2009), Mongiovi (2002), and Veneziani (2004).

[2]For a detailed presentation and in-depth analysis of this approach, see Cogliano, Flaschel, Franke, Fröhlich, and Veneziani (2017).

it measured in money or units of labor time—creation in commodity production. A reduced form of Marx's circuit can be written as:

$$M \rightarrow C \dots P \dots C' \rightarrow M'. \tag{1}$$

The $M \rightarrow C$ portion of equation (1) represents the initial outlay of financial capital to purchase labor power and materials which includes an initial transformation of money into Marx's variable and constant capital. A production process P is then activated and labor power is expended to transform raw materials into new commodities C'. In order to realize the value of these new commodities they must be converted back into the money form M'. Because $M' > M$, M' contains surplus value realized in the money form.

The $C' \rightarrow M'$ stage of the circuit consists of activities undertaken by Commercial Capital (merchant capital in Marx's terminology) and Financial Capital. As value in the circuit undergoes changes between money- and commodity-form the magnitude of value itself does not change. Value is conserved over the $M \rightarrow C$ and $C' \rightarrow M'$ phases of the circuit. It is these phases, at which value undergoes a change in form, that unproductive activities exist. New value is only created in the process of producing commodities P and unproductive activities are funded through transfers of surplus value from these production processes.

In Marx's own words:

> The general law is that *all circulation costs that arise simply from a change in form of the commodity cannot add any value to it.* They are simply costs involved in realizing the value or transferring it from one form to another. The capital expended in these costs (including the labour it commands) belongs to the *faux frais* of capitalist production. The replacement of these costs must come from the surplus product, and from the standpoint of the capitalist class as a whole it forms a deduction of surplus-value or surplus product, in just the same way as that time that a workers needs to buy his means of subsistence is lost time for him [emphasis in original] (Marx 1978, 225-226).

The passage above provides a clear way of distinguishing productive from unproductive activities according to where they fall within the circuit of capital. This is the principle of identifying unproductive activities used in this paper, which is also clearly stated by Rubin (1990) and Mohun (1996).

Figure 1 adapts a diagram of Marx's circuit of capital from Foley (1986, 67) that is helpful for locating unproductive activities and the transfers of surplus value that take place over the circuit. In Figure 1 Financial Capital represents the $M \rightarrow C$ stage of the circuit, P is represented by Productive Capital, and the $C' \rightarrow M'$ stage extends over Commercial and Financial Capital. According to the passage above, all of the activities taking place at the stage spanning Commercial and Financial Capital are involved in changes in the form of value, and therefore, do not contribute to value creation. The creation of new value takes place in Productive Capital, where labor power transforms means of production and raw materials into new commodities. Activities occurring at this phase are considered *productive*. Any activities responsible for a change in form of value are considered *unproductive*. These unproductive activities are funded through transfers of surplus value, which means that all revenue and expenses (including wages) of these activities are funded by surplus value produced elsewhere in the circuit.

Figure 1: Marx's Circuit of Capital
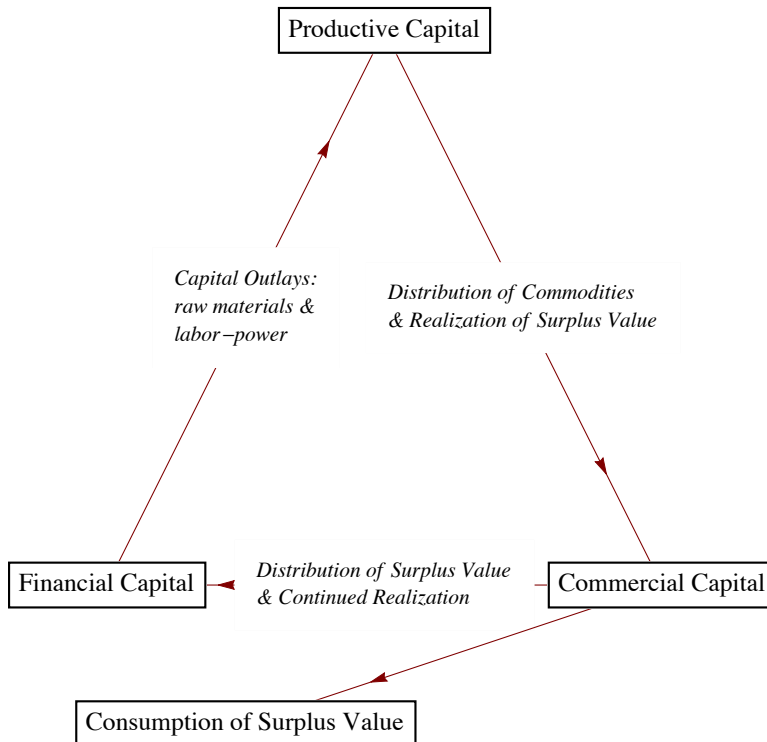
The terminology of 'productive' and 'unproductive' is unfortunate given the seemingly pejorative overtones of deeming something unproductive. Marx inherits the terminology of productive and unproductive from Smith's (2000) discussion of productive and unproductive labor, and the terms are adopted here to avoid any potential confusion arising from introducing new terminology. In light of terminology issues, even if unproductive activities are not considered to create value, this does not mean that capitalist economies can necessarily survive without these activities. It is difficult to imagine modern capitalist economies functioning without financial capital to provide liquidity for commodity production, or without commercial capital to handle the distribution and sale of commodities. Hence, it would be appropriate to consider these activities socially necessary despite the classification as unproductive.

The presence of unproductive activities in capitalist economies is another instance of how transfers of surplus value can entail a disconnect between surplus value production and realization. In Figure 1, Productive Capital realizes some amount of the surplus value it produces as profit. The remainder of the surplus value created by productive capital becomes revenue for Commercial and Financial Capital. This separation between surplus value production and realization is similar to that presented in Section 2.1, where surplus value is reallocated through the process of capitalist competition. As Marx (1981, 477-478, 493) notes, competition between 'industrial' (productive) capital and financial capital is competition over claims on surplus value.[3] This type of competition extends to the relationship between in-

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[3]For Marx, the competition between industrial and financial capital also forms the interest rate (Marx 1981, 493). The Marxian theory of interest is beyond the scope of this paper, but for detailed analyses of

dustrial and commercial capital so that the circuit of capital captures the competition among different types of capital over shares of the surplus value created by productive capital.

2.3   Surplus Value Production

Sections 2.1 and 2.2 show how transfers of surplus value introduce an interesting separation between the production and realization of surplus value in Marx's work. The presentation thus far can now be pulled together to present a complete framework for estimating the differences between surplus value production and realization. The aim is to develop an account of surplus value production at the industry level to compare this to the realization of surplus value by industry in order to capture the movements of surplus value taking place over the course of capitalist competition.

To develop such an account, we first turn back to Table 1. A key takeaway from Table 1 is that surplus value production at the industry level is proportional to the amount of living labor (Marx's Variable Capital) engaged in said industry, whereas surplus value is realized as profit according to the amount of capital advanced to equalize the profit rate. With this in mind, it is possible to estimate the amount of surplus value produced from data on wages and the rate of surplus value. This can first be explained in aggregate terms to illustrate the relationship between living labor expended and surplus value production.

Let the subscripts p and u respectively denote productive and unproductive. Let Y denote aggregate value added in price (or money) terms, let W denote aggregate wages paid to workers, let S be aggregate money surplus value, and let by Π be aggregate profits. The following relationship then holds

$$Y = W_p + W_u + \Pi, \tag{2}$$

where the wages paid for unproductive activities and profits taken together are equal to total money surplus value:

$$S = W_u + \Pi. \tag{3}$$

Equation (3) follows from the combined insights of Sections 2.1 and 2.2, and earlier work adopting the NI (Mohun 2014). In Section 2.1, absent unproductive activities, aggregate surplus value is equivalent to aggregate profit. Once unproductive activities are taken into account, as in Section 2.2, aggregate surplus value needs to be able to cover the costs of unproductive activities in addition to the profit of commodity-producing activities. S then includes the wages of unproductive labor W_u and the profit of unproductive industries, which is some portion of Π, in addition to the profit of productive industries. Taking equations (2) and (3) together one arrives at:

$$Y = W_p + S. \tag{4}$$

Aggregate value added is the sum of the wages of productive labor and money surplus value.

The rate of surplus value e is then the ratio of money surplus value to the wages of productive labor:

$$e = \frac{S}{W_p},$$

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the interest rate in Marxian theory, see Panico (1980, 1988).

or with equation (4)

$$e = \frac{Y - W_p}{W_p}.$$ (5)

Solving equation (5) for Y we have

$$Y = (1 + e)W_p,$$ (6)

which when taken with equation (4) and solving for S yields

$$S = eW_p.$$ (7)

Equation (7) shows that money surplus value creation is proportional to the wages of productive workers. The steps to arrive at equation (7) are just the manipulation of accounting relationships, yet this captures a key principle for the current analysis. Equation (7) is the aggregate version of the principle that surplus value production is proportional to the expenditure of productive labor power.

As seen in Table 1, this idea applies at the industry level. For a given industry i, the money surplus value produced s_i can be written as

$$s_i = e_i W_{p,i}.$$ (8)

Industries can be sorted into productive and unproductive so that e and $W_{p,i}$ are known, but there is the question of the rate of surplus value at industry level e_i.

In Table 1, and in volume three of *Capital*, Marx assumes that e_i is equalized across industries, i.e. $e_i = e$ for all i. Marx explains the formation of a uniform e as a result of the mobility of labor and competition among workers. The uniform e is then elevated to the level of a central tendency of capitalist economies in much the same way as the equalization of the profit rate (Marx 1981, 275). This equalization is also meant to take skill differentials into account, where workers with above average skills and higher wages produce correspondingly greater amounts of surplus value such that the uniform e holds (Marx 1981, 241-242).[4] Marx's e can then be calculated from aggregate data as in equation (5) and used in equation (8) to impute money surplus value production at the industry level:

$$s_i = eW_{p,i}.$$ (9)

Marx's assumption of a uniform e stems from his long-period method (Garegnani 1970, 1976, 1984; Foley 2011a) in which the abstract assumptions of mobile labor and capital lead to the rate of surplus value and profit rate independently equalizing (Cogliano 2011, 2013). Assuming a uniform e may be a strong assumption to make given the institutional barriers to labor mobility that exist in modern economies. For instance, the training and education necessary for certain lines of work can take years to complete, making it difficult for workers to switch careers in their lifetime. Similarly, documented labor market segmentations will inhibit the free mobility of labor that Marx sees as leading to the equalization of e.[5] One

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[4]To further explain the assumption of a uniform rate of surplus value Marx (1981, 241) refers to Smith (2000). For further discussion of the roots of Marx's equalized rate of surplus value assumption, see Cogliano (2011, 2013) and Cogliano et al. (2017).

[5]See Gordon, Edwards, and Reich (1982) for more on labor market segmentation.

need not necessarily assume a uniform e to estimate surplus value production at the industry level using the method outlined above, but one does need to make some assumption about the distribution of e_i across the i industries. In fact, any empirical estimation of labor values implicitly makes some assumption about the distribution of e_i in order to derive estimates for labor values from available price data. Such is the case in empirical estimates of the relationship between labor values and prices done by Chilcote (2004), Ochoa (1989), Shaikh (1998, 2016), and Shaikh and Tonak (1994) that show a close relationship between labor values and prices. Morishima and Seton (1961, 206) were the first to recognize the need for some assumption about the rate of surplus value to estimate labor values, and the need for an assumption of this type is also necessary for estimating surplus value production in the present analysis.

The primary assumption about the distribution of e_i explored in Section 4 is Marx's own assumption of $e_i = e$ for all i. This is done as a rough first pass to see how surplus value production compares to its realization supposing Marx is correct that e is uniform. This provides an account of what surplus value transfers look like over the course of capitalist competition. Alternative assumptions about the frequency of the equalization of e_i are explored in Appendix C. When using different assumptions about e (i.e. equalizing over business cycles or another time period) the overall picture in the results in Section 4 remains largely unchanged. Furthermore, even though barriers to mobility like labor market segmentation exist empirically, this does not mean that the tendency for e to equalize is not operating, nor do barriers to labor mobility subvert competition among workers and the relevance of the equalization of e of Marxian theory.

It is worth noting that Marx's assumption of a uniform e implies that the conditions and experience of exploitation is uniform across workers. This is because Marx takes e as a direct indicator of the degree of exploitation. However, this is a narrow interpretation of exploitation and does not necessarily provide a compelling description or explanation of the different ways workers can be exploited, precisely what makes one person an exploiter versus being exploited, how exploitation and class necessarily map onto each other, or what causes the persistence of exploitation and class in capitalist economies. The project of a detailed and coherent theory of exploitation and classes started with Roemer (1982) and has been further explored and generalized by Skillman (1995, 2014, 2017), Veneziani (2007, 2013), Veneziani and Yoshihara (2012, 2013, 2015, 2017), and Yoshihara (2010). One important aspect of this literature is understanding the conditions under which exploitation and classes persist in accumulating economies, since Veneziani (2007) shows this is not the case in Roemer's (1982) original framework. Recently, Cogliano, Veneziani, and Yoshihara (2016) have used a computational approach to show how technical change and uneven distributions of bargaining power can lead to the persistence of exploitation and classes. It is also worth noting that Veneziani and Yoshihara (2013) have shown how a coherent set of definitions of exploitation and classes is consistent with the NI. A comprehensive survey of developments in exploitation theory is provided by Yoshihara (2017). Insights from the exploitation literature raise the question of whether the present analysis fully captures the exploitative conditions of workers. Questions along these lines are beyond our current scope, but provide fertile ground for future considerations.

The last detail of the current approach that warrants mention is the issue of dealing with magnitudes measured in money (prices) and those measured in units of labor time

(labor values). Equation (9) provides an estimate of the money surplus value produced in productive industry i, which can be converted to units of labor time using the NI's MELT. Letting μ denote the MELT, equation (9) can now be written as

$$s_i^v = \frac{eW_{p,i}}{\mu},\tag{10}$$

where s_i^v is surplus value produced in industry i with the superscript v denoting that s is measured in units of labor time. Equation (10) is what will be estimated for the U.S. economy in Section 3 and compared to the surplus value realized as profit by all productive and unproductive industries.

Use of μ to go between labor time and price magnitudes is characteristic of the NI, yet one question that may arise is whether or not e is equivalent when measured in labor value terms or price terms. In Marx's presentation of the transformation of labor values into prices he assumes e is the same when calculated in labor value or price terms, respectively called the value rate of surplus value and price rate of surplus value. Yet, in what Foley (2000) calls the standard 'dual-system' interpretation of Marx, the value and price rates of surplus value will not be equivalent. A helpful feature of the NI is that e is the same whether measured in labor value or price terms.[6] This allows for easy calculation of e and estimation of surplus value production, hence the natural choice of the NI.

3 Estimating Surplus Value Production

This section uses the GDP by Industry data from the Bureau of Economic Analysis (2017) to empirically estimate equation (10) for the U.S. To arrive at estimates for equation (10) it is first necessary to calculate e using equation (5). This requires sorting industries in the GDP by Industry sheets into productive and unproductive using the principle presented in Section 2.2. The estimates that follow allow examination of the discrepancies between surplus value produced and realized at the industry level.[7]

3.1 Productive and Unproductive Industries

Following the principle for distinguishing productive from unproductive activities developed in Section 2.2, as well as Basu and Foley (2013) and Foley (2011b), the industries (mostly) at the two-digit NAICS level in the BEA GDP by Industry tables are placed within the circuit of capital according to the type of activity undertaken. This sorting of industries is shown in Figure 2. The productive industries directly involved in commodity production are placed under Productive Capital, these are: Agriculture; Manufacturing; Construction; Information Services; Mining; Utilities; Transportation and Warehousing; Administrative and

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[6]See Appendix A for a detailed presentation of the rate of surplus value in the dual-system interpretation and the NI. This presentation is placed in an appendix to avoid potential confusion introduced by duplicating symbols.

[7]The spreadsheets used to organize the data and the code to perform the surplus value imputation in Section 3 and to generate the charts in Section 4 are available from the author upon request. The imputation and charts are done in *Mathematica* version 11. Additional details of the data are provided in Appendix B.

Waste Management Services; and Arts, Entertainment, Accommodation, and Food Service (AEAF).

Figure 2: U.S. Industries in the Scheme of Circulation
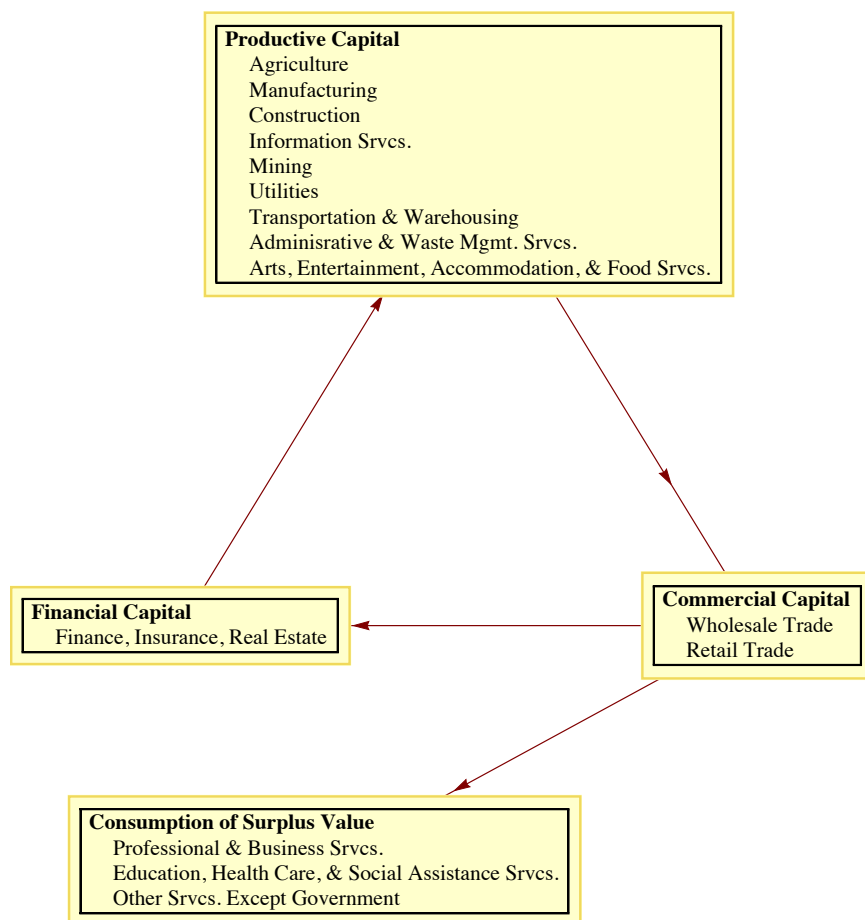
As explained in Section 2.2, any activities involved in a change in form of commodities are classified as unproductive. These are the industries fitting into Financial Capital and Commercial Capital: Finance, Insurance, and Real Estate (FIRE); Wholesale Trade; and Retail Trade. One difference between the classification in this paper and that of Basu and Foley (2013) and Foley (2011b) is that this paper does not count the Wholesale and Retail Trade industries as creating value. The conventionally measured value added by the Wholesale and Retail Trade industries belongs to part of the of surplus value produced by the Agriculture, Mining, Construction, Manufacturing, and Information Services industries.

Industries that are largely paid out of surplus value and do not fit into financial and commercial capital are placed under Consumption of Surplus Value, these industries are: Professional and Business Services (PBS); Education, Health Care, and Social Assistance Services (EHS); and Other Services Except Government. As in Basu and Foley (2013) and Foley (2011b), these industries are not directly involved in commodity production and can be thought of as being paid mostly out of surplus value produced by productive industries. A portion of the EHS industry may not be paid out of surplus value since households do have

to pay for education and health services to some extent in the U.S. However, this does not change the fact that this industry does not produce a vendible, measurable commodity (Basu and Foley 2013; Foley 2011b). The EHS sector only realizes value produced in other parts of the circuit of capital, whether the revenue comes from the income of worker households or capitalist households, the EHS industry is just realizing value garnered by households employed in industries located at different phases of circulation.[8] Following Mohun (2013, 2014) and Moseley (1986), government expenditures are removed from the circuit. Government revenue from corporate taxes comes out of the circuit, but the tax revenue from wages does not. Thus, government is netted out of the estimation to avoid double counting.

To further clarify which industries in the BEA GDP by Industry data are classified as productive or unproductive the sorting of Figure 2 is translated into Table 2.

Table 2: Productive and Unproductive Industries in the U.S.

Productive	Unproductive
Agriculture	Finance, Insurance, & Real Estate (FIRE)
Manufacturing	Professional & Business Services (PBS)
Construction	Education, Health Care, & Social Assistance Services (EHS)
Information Services	Other Services Except Government
Mining	Wholesale Trade
Utilities	Retail Trade
Transportation & Warehousing	
Administrative & Waste Management Services	
Arts, Entertainment, Accommodation, & Food Services (AEAF)	

With the classifications of Figure 2 and Table 2 it is now possible to calculate equation (5) from data on value added and wages by industry. It is worth noting that the above classification of productive and unproductive is done at the industry level according to the type of activity undertaken. This is not the only way one can conceive of classifying productive from unproductive. It is also possible to make such a distinction based on class, as Mohun (2013, 2014) does. Mohun's (2013; 2014) distinction between productive and unproductive

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[8]This type of transfer could be viewed as a transfer of value within the circuit rather just a transfer of surplus value. In fact, some parts of the FIRE industry's income could be perceived as transfers of value from households as well.

labor is based on whether or not a worker is non-supervisory or a supervisor in addition to classifying activities involved in a change in form of a commodity as unproductive. Distinguishing productive from unproductive according to type of activity could be considered incomplete, yet it provides a good first approximation to examine the divide between surplus value production and realization.

3.2 Imputed Surplus Value Produced and Surplus Value Realized

The GDP by Industry data can now be used to calculate e, which is necessary to impute the surplus value produced by productive industries. Referring back to equation (5), GDP net of government spending is used to represent aggregate value added Y.[9] Total compensation of employees in productive industries of Table 2 is used to represent total productive wages $W_p = \sum_i W_{p,i}$ where $W_{p,i}$ denotes the i productive industries. e_t for a given year t is:

$$e_t = \frac{S_t}{W_{p;t}} = \frac{Y_t - \sum_i W_{p,i;t}}{\sum_i W_{p,i;t}} = \frac{W_{u;t} + \Pi_t}{W_{p;t}}. \tag{11}$$

In equation (11) the total money surplus value is all of the profit across productive and unproductive industries plus the total compensation of employees in the unproductive industries. This approach treats the whole of money value added in the unproductive industries in Table 2 as money surplus value. e is calculated annually from 1987-2015 based on available data and shown in Figure 3 with a comparison to a conventional profit-wage ratio. The profit-wage ratio is calculated as the ratio of total profits in the GDP by Industry data to total compensation of all employees: $\Pi_t/(W_{p;t} + W_{u;t})$.

Shaikh and Tonak (1994), Mohun (2005, 2006), and Paitaridis and Tsoulfidis (2012) provide similar calculations of e, but the results differ due to differences in what is taken as Y and how the classification of unproductive labor is implemented. Paitaridis and Tsoulfidis (2012) provide a comparison of their estimate of e to Shaikh and Tonak (1994) and Mohun (2005, 2006). All three calculations follow the same trend, but Paitaridis and Tsoulfidis's is shifted up, above those of Shaikh and Tonak (1994) and Mohun (2005, 2006). The calculation of e in Figure 11 lies above that of Paitaridis and Tsoulfidis (2012) because it considers a larger portion of aggregate value added to be money surplus value. Indeed, differences between calculations of e rest on what is considered surplus value and how unproductive labor are treated (Moseley 1986, 180).

The upward trend of e_t in Figure 3 signals the persistent increase in exploitation of productive laborers. In fact, the sharpest increases in e occur during the two most recent economic downturns.[10] In spite of the turmoil associated with the crisis of 2008, capitalists were able to extract more surplus value from workers. The e_t shown in Figure 3 can now be used to impute surplus value production for the productive industries in Table 2 following equation (10).[11] The surplus value $s_{i;t}^v$ produced by productive industry i in year t is imputed

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[9]As Moseley (1986) and Mohun (2013, 2014) are careful to note, government expenditures do not occur within any phase of the circuit of capital, thus they are netted out GDP.

[10]The shaded regions in all figures denote NBER recessions rounded to the nearest year.

[11]The imputation method of this paper does not make adjustments for the surplus value that could be transferred from the rest of the world to the U.S. or vice versa via international trade. If prices in every

Figure 3: Rate of Surplus Value & Profit-Wage Ratio for the U.S. 1987-2015
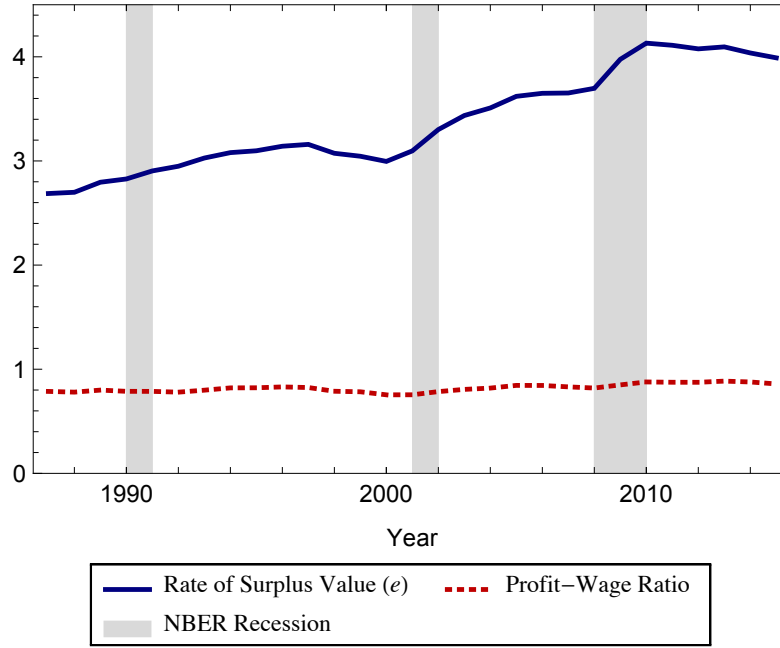
as follows:

$$s_{i;t}^v = \frac{e_t W_{p,i;t}}{\mu_t}. \tag{12}$$

The μ_t term in equation (12) represents the MELT for year t and converts hours of labor time into dollars, or vice versa (Foley 2005, 2011a). As Moseley (2011b) points out, in the case of non-commodity money, the MELT—and inversely the value of money—only depends on aggregate value added and total hours worked, and not on any particular commodity acting as money (e.g. gold). Hence, it is possible to estimate the MELT from value added in terms of dollars and hours worked by employed labor. This particular estimation of the MELT rests on the notion that capitalism's market processes render labor homogeneous and abstract (Mohun 2004, 78). The formula for μ_t is given by the following equation:

$$\mu_t = \frac{Y_t}{H_t} \tag{13}$$

For the current procedure, μ_t is calculated from the BEA's GDP by Industry data and the Employment, Hours, and Earnings data from the Bureau of Labor Statistics (2017). The total hours worked H_t is calculated by using the BLS data on total non-farm employment and the average weekly hours worked in each of the industries in Table 2. The average hours worked per week for the whole economy is taken as the average across industries. This average is then multiplied by fifty weeks, assuming the average worker in the U.S. works fifty full work-weeks per year. The average total hours is then multiplied by the total non-farm

country were proportional to labor values yet countries could have different e, then there will be transfers of surplus value between countries engaging in international trade. If prices are not proportional to labor values, which is the general case, then there will inevitably be transfers of surplus value between countries through international trade.

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employment, yielding an estimate of the total socially necessary labor time expended in the U.S.

There is the question of whether or not all labor should be counted in estimating the MELT, or if estimations should be restricted to productive labor only. The definition of the MELT rests on consideration of socially necessary labor time. Hence, all labor time is used to calculate the MELT since labor can be socially necessary for the totality of capitalist production while being unproductive in the sense that it does not create value. Figure 4 plots a 'broad' MELT estimated using total non-farm employment and a 'narrow' MELT estimated using data on work hours and employment for the productive industries in Table 2.[12] The estimation of $s_{i;t}^v$ in equation (12) uses the broad MELT for μ_t.

Figure 4: Monetary Expression of Labor Time (MELT) for the U.S. 1987-2015
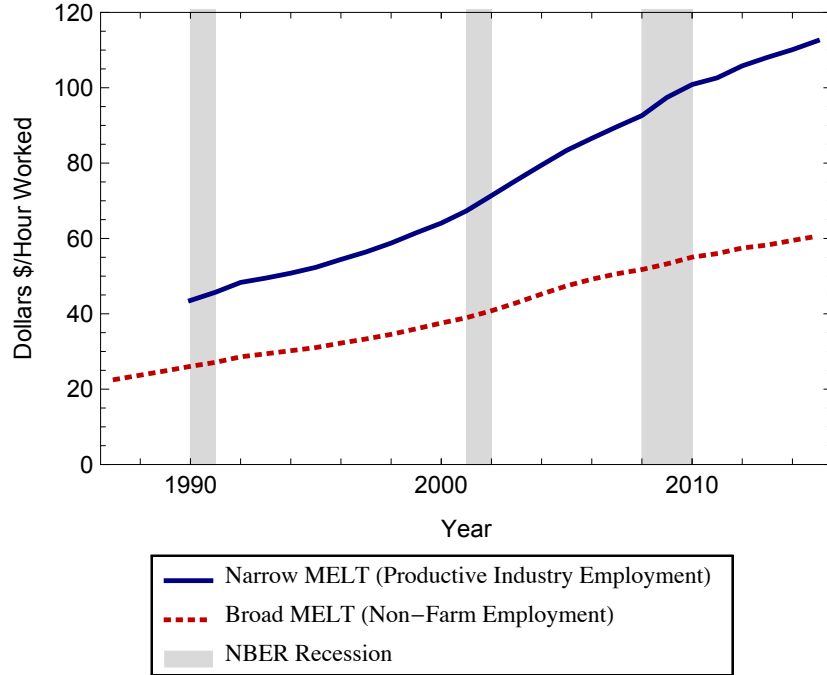
With estimates for e_t and μ_t, and data on $W_{p,i;t}$, the surplus value generated by productive industries can now be imputed and compared to the surplus value realized as profit by each industry. The surplus value realized as profit for productive industries $\pi_{p,i;t}$ is taken as the difference between money value added and compensation of employees: $\pi_{p,i;t} = Y_{p,i;t} - W_{p,i;t}$ for productive industries in Table 2. For unproductive industries, this approach treats the entirety of their money value added as realized money surplus value, thus $\pi_{u,i;t} = Y_{u,i;t}$, i.e. what is reported as GDP in the GDP by Industry data for the unproductive industries in Table 2 is taken as said industries' realized money surplus value.

The imputation of $s_{i;t}^v$ is done annually from 1987-2015, first using annual rates of surplus value e_t from equation (11), which assumes that e is uniform across industries in each year.

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[12]The data on employment and average weekly hours for the Administrative and Waste Management Services industry only extends back to 1990 in NAICS classification. Thus estimates of the narrow MELT only go back to 1990 and estimation of the broad MELT is done without data on this industry from 1987-1989.

The imputation of industry-level surplus value production can be performed under alternative assumptions about the distribution of e and the frequency at which it equalizes. For instance, it could be assumed that e equalizes over business cycles or over a four-year period.[13] Even with alternative assumptions about the frequency at which e equalizes, the results do not change a great deal. As discussed above, assuming an annually equalized e is a strong assumption, yet it allows us to address the question: what does surplus value production at the industry level look like supposing Marx is correct?

4 Surplus Value Production and Transfers

4.1 Imputed Surplus Value

The overall result of imputing $s_{i;t}^v$ is shown in Figure 5 which captures the total production and realization of surplus value for the U.S. at the industry level from 1987 to 2015. Both surplus value production and realization are expressed as percentages of the whole in order to illustrate the overall net transfer of surplus value from productive to unproductive industries, and to provide a sense of the size of industries relative to each other. Each industry's share of surplus value produced is reported in the bars on the positive portion of the vertical axis in Figure 5, whereas shares of surplus value realized are reported on the negative portion of the vertical axis to juxtapose surplus value production and realization.[14]

Figure 5: Total Surplus Value Production vs. Total Surplus Value Realization by Industry, 1987-2015
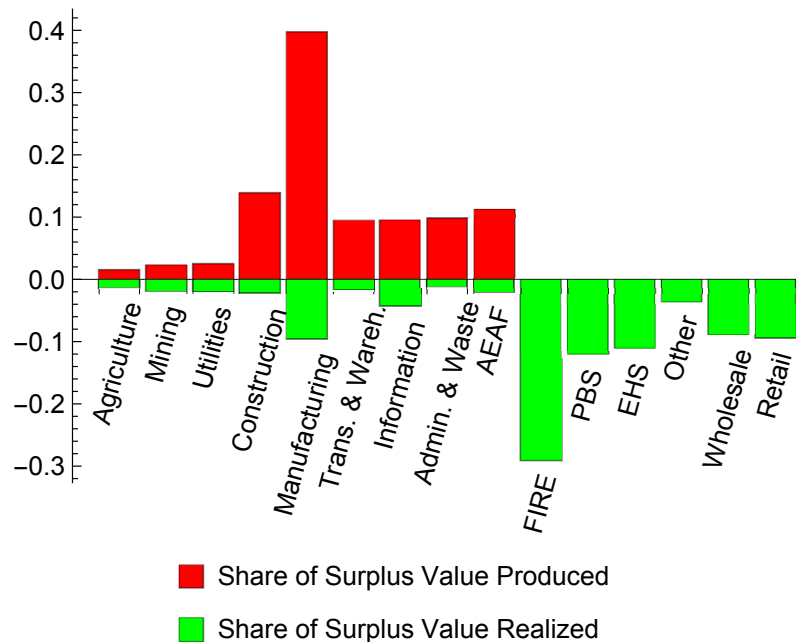

Figure 5 shows that over the period from 1987 to 2015 there is a general drift of surplus value created in productive industries being realized in unproductive industries, particularly

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[13]Examples of these alternative assumptions are explored in Appendix C.
[14]Each set of bars respectively sum to one.

the FIRE industries. Figure 5 also reveals that productive industries realize far less surplus value than they produce. Marx's presentation of the formation of prices of production and capitalist competition, as described in Section 2.1, indicates that surplus value should be realized as profit in proportion to capital invested in order to equalize the rate of profit across industries. What appears to be happening is that through this process of competition, the unproductive industries are able to realize large amounts of surplus value via what Foley (2013, 259-260) describes as their positioning in markets.

One caveat of Figure 5 is that there is no control for industry size. Thus, large industries like Manufacturing produce a great deal of the total surplus value in the economy from 1987-2015 because they have high employment numbers relative to other industries. Without controlling for industry size the results of Figure 5 do not tell the complete story of surplus value production and realization. It then makes sense to examine the results in per worker terms across industries by taking $s^v_{i;t}/L_{i;t}$, with $L_{i;t}$ representing employment in productive industry i in year t, and compare the results of surplus value production per worker to surplus value realization per worker across industries. These results are reported in Figure 6 in a similar way as those in Figure 5; surplus value production and realization per worker for each industry are reported as shares of the total surplus value produced or realized per worker over the time period 1990-2015. The BLS data used do not have employment figures for the Administrative and Waste Management Services industry for 1987-1989 or for the Agriculture sector at all, hence the shorter time scale and fewer industries in Figure 6 compared to Figure 5.

Figure 6: Total Surplus Value Production per Worker vs. Total Surplus Value Realization per Worker by Industry, 1990-2015
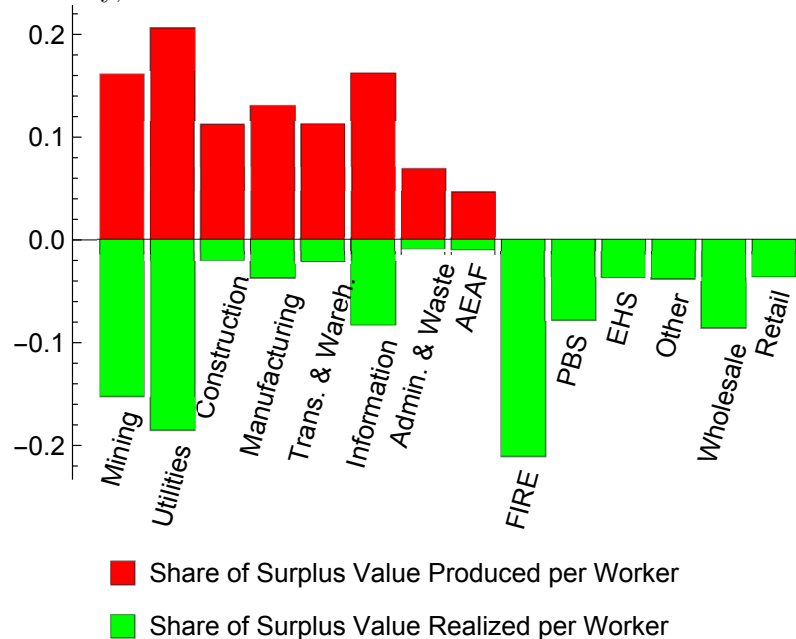
There are some interesting features of Figure 6 when compared to Figure 5. The most immediate of these is that the range of surplus value produced per worker across industries is much smaller than the total surplus value as in Figure 5. Next, the Mining and Utilities

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industries, while still breaking close to even in terms of surplus value production versus realization, now produce substantially larger shares of the total surplus value produced per worker. This is likely a reflection of the high capital intensity of production of these industries. A similar trend appears when comparing the Transportation and Warehousing industry across Figures 5 and 6, except this industry remains a large net producer of surplus value over the time series. Perhaps the most striking difference between the two figures is that Manufacturing, while producing the largest overall share of surplus value, produces less surplus value per worker than the Mining, Utilities, Transportation and Warehousing, and Information Services industries. The trend of surplus value realization across unproductive industries is largely unchanged across the two figures, except for reductions in the surplus value realized per worker in the EHS and Retail Trade industries, reflecting high employment in these industries.

The results in Figures 5 and 6 demonstrate the helpfulness of adopting some distinction between productive and unproductive labor to understand the process by which surplus value is transferred across industries in the process of profit rate equalization. Having an understanding of the pattern of transfers across industries also helps to understand the source of profit for some large industries in the U.S. economy. It is also possible to examine industry-level surplus value production and realization annually as in Figures 7 and 8. These figures show annual shares of industry-level surplus value production and realization from 1987-2015.

Figures 7 and 8 provide a picture of how surplus value production and realization can vary year to year. There are notable variations in the Agriculture, Mining, and Utilities industries where in some years these industries are net producers of surplus value and in others they are net realizers of surplus value. The Mining industry is an interesting case of an industry that presumably benefits from commodity price bubbles, e.g. gold, silver, and especially copper in recent years. Mining is a net producer of surplus value from 1987 until the late 2000s, but is a net realizer of surplus value from 2005-2008, just as the recent crisis was brewing. However, the overall contribution of Mining to surplus value, as well as its overall realization, is relatively small compared to the other productive industries. The consistent net producers of surplus value are the: Construction; Manufacturing; Transportation and Warehousing; Information Services; Administrative and Waste Management Services; and AEAF industries. Figure 8 shows the shares of total surplus value realized by unproductive industries from 1987-2015. The increase in shares of surplus value realized by the PBS and EHS industries is notable, as FIRE remains steady and Retail Trade declines.

Just as Figure 6 controls for industry size, Figures 9 and 10 do so for annual shares of industry-level surplus value production and realization from 1990-2015. Figures 9 and 10 tell a similar story to Figures 7 and 8, yet certain patterns are accentuated. Mining is a net realizer of surplus value per worker from 2005-2014 with a switch back to net surplus value production in 2015. Utilities is still a net producer of surplus value per worker from 2000 onward. Figure 10 shows an interesting trend that unproductive industries have experienced a decrease in the share of total surplus value realized per worker. This is notable for the FIRE industry, where surplus value realized per worker has declined overall since 2002. This points to potential difficulties for financial firms to realize surplus value within the circuit of capital, and to these industries absorbing most of recent employment growth with little additional surplus value realization to show for it. The decreases in surplus value

Figure 7: Percent of Total Surplus Value Produced vs. Percent of Total Surplus Value
Realized 1987-2015

realized by unproductive industries is offset by increases in surplus value realized by Mining,
Manufacturing, and Information Services.

4.2 Transfers of Surplus Value

Another way to look at the changes over time in Figures 7-10 is to examine the transfers
of surplus value to unproductive industries as a whole in Figure 11 and the growth rate of
transfers of surplus value as in Figure 12. Figure 11 shows a steady increase in the total
transfers of surplus value to unproductive industries throughout the 1990s with volatility in
the 2000s and a steady increase after the recent crisis. Changes in the pattern of surplus
value transfers is one way that transfers from productive to unproductive industries could
contribute to instability in the circuit of capital and economy overall.

The growth rate of transfers of surplus value in Figure 12 appears to fall in-line with the
NBER recession dates, and even presages recessions to some degree. One possible explanation
for this is the collapse of producer prices as commodity and asset markets soften in the lead-
up to recessions and larger crises. Or causation runs in the other direction and the inability

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Figure 8: Percent of Total Surplus Value Produced vs. Percent of Total Surplus Value Realized 1987-2015, contd.

| Share of Surplus Value Produced | Share of Surplus Value Realized |
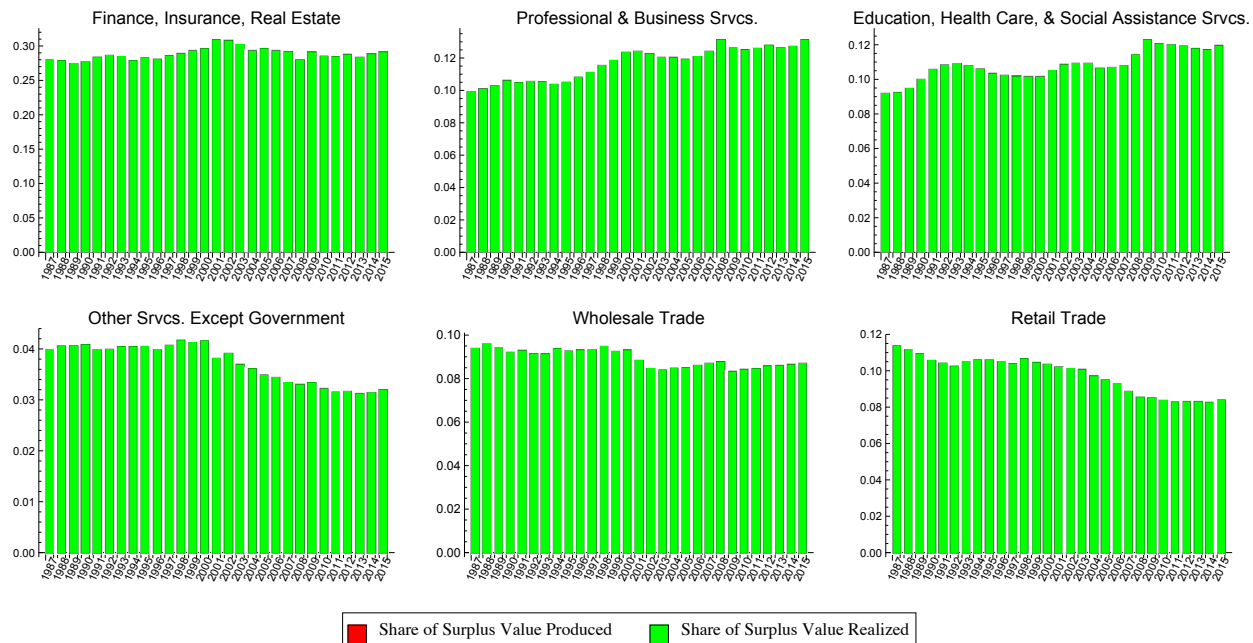
of industries dedicated to realizing surplus value and value for the whole capitalist circuit contributes to the softening of financial markets in the lead-up to a crisis. Another possible explanation for variability in surplus value transfers is changes in interest rates. One of the FIRE industry's primary means by which it extracts revenue from the circuit of capital is through, as Lapavitsas (2013) notes, advancing loans. Thus, the overall amount of leverage in the system could contribute to the pattern of surplus value transfers. Further sources of revenue for the FIRE industry, as detailed by Lapavitsas (2013), are the trading of equities and the trading of financial assets, the latter of which can have direct ties to 'fresh flows of surplus value' (Lapavitsas 2013, 168). A complete explanation likely consists of some amalgamation of all of these factors and further exploration is required to sort through each. Regardless of which factors dominate the pattern of surplus value transfers, they are all emblematic of competition between capitalists for shares of surplus value produced in the economy. Thus, in some sense, economic crises foment out of the struggle between capitalists over surplus value.

5   Capitalist Competition and Instability?

There are two primary ways to interpret the results in Section 4. The first is that the results capture the movement of surplus value across industries in the process of competition among capitalists. The second is that the results bring to light a relationship between productive and unproductive industries that may contribute to economic instability. These two threads share competition as a common feature. From the classical-Marxian perspective, the overall result of competition is the tendential equalization of the profit rate. One facet of this

Figure 9: Percent of Total SV Produced per Worker vs. Percent of Total SV Realized per Worker 1990-2015

competition is the competition between productive and unproductive industries which is highlighted in Section 4. These two aspects of the results are discussed below.

5.1 Competition and the Profit Rate

Marx's presentation of the formation of prices of production and equalization of the profit rate in volume three of *Capital*, as well as the sketch of Marx's transformation in Section 2.1, indicate that relatively capital-intensive industries would need to receive transfers of surplus value from relatively labor-intensive industries in order for the profit rate to equalize. The results of Figures 7 and 8 seem to contradict this conclusion. Capital-intensive industries like Mining, Utilities, and Transportation and Warehousing are not realizing more surplus value than they produce. In fact, the capital-intensive industries appear to be transferring surplus value to other industries (both productive and unproductive). This is particularly apparent in the total figures reported in Figure 5.

While the Mining and Utilities industries produce and realize small shares of the total surplus value, the Transportation and Warehousing industry produces a sizable share of the

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Figure 10: Percent of Total SV Produced per Worker vs. Percent of Total SV Realized per Worker 1990-2015, contd.
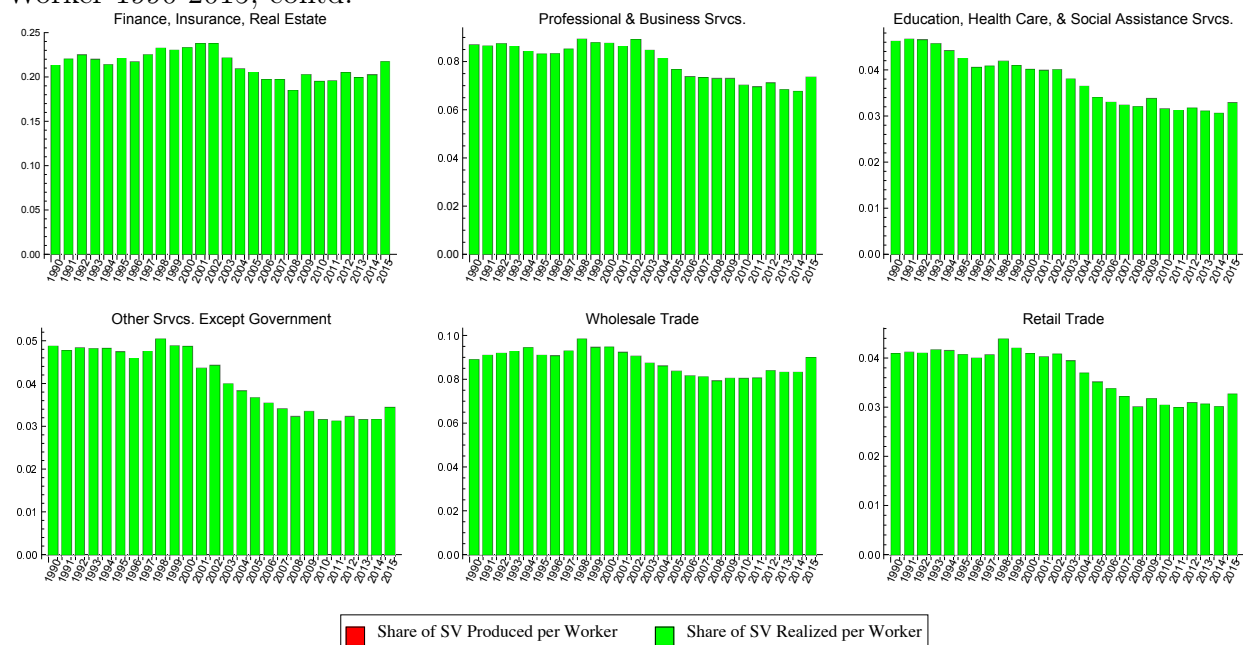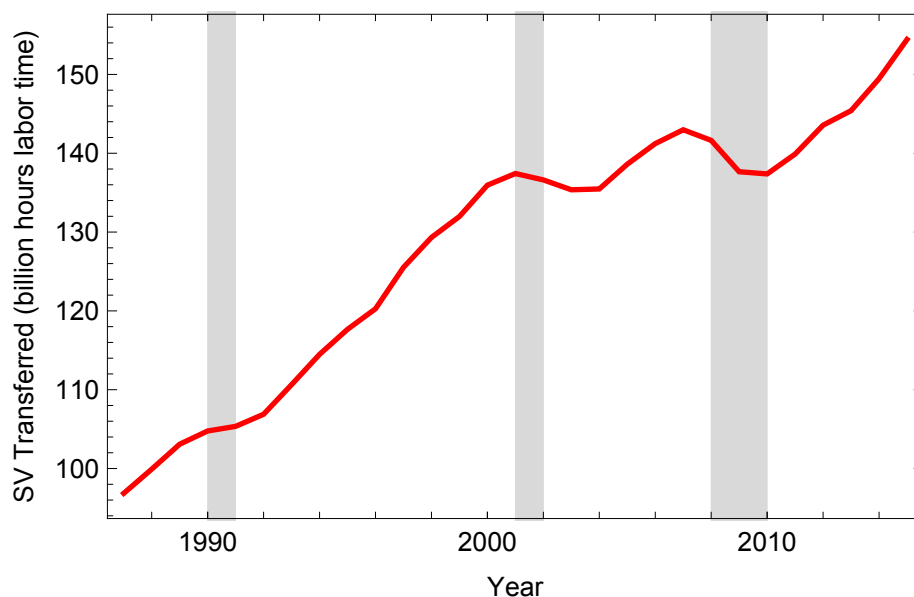

Figure 11: Transfers of Surplus Value to Unproductive Industries, 1987-2015

total surplus value and realizes very little as profit. These results are not entirely inconsistent with other empirical investigations. Duménil and Lévy (1999, 2002), for instance, find that highly capital-intensive industries do not seem to participate in the equalization of the rate of profit.[15] Their results indicate that some gravitation of profit rates around a

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[15]Duménil and Lévy (1993) also present some analysis of the gravitation of profit rates. However, the

Figure 12: Growth Rate of Surplus Value Transfers to Unproductive Industries, 1987-2015
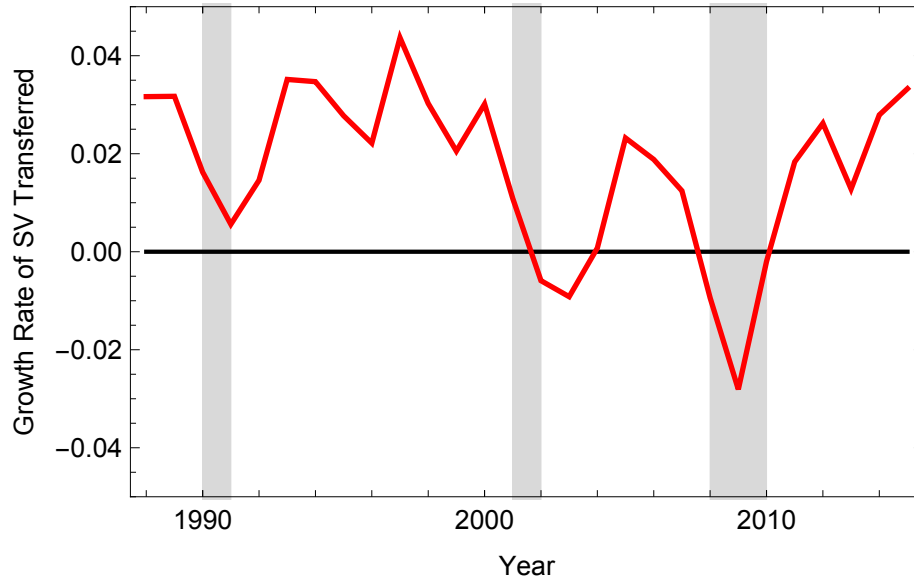
common trend occurs in the manufacturing (when dis-aggregated), trade, and some service industries. However, they find it 'striking that competitive mechanisms do not ensure "normal" profit rates' (Duménil and Lévy 2002, 433) in highly capital-intensive industries like Mining, Utilities, and Transportation and Warehousing. At the level of aggregation used in the current imputation method the Manufacturing sector also transfers surplus value to other productive and unproductive industries.

The overall story told by Figures 7 and 8, and summarized in Figure 5, is consistent with Duménil and Lévy's (2002) conclusion that pricing mechanisms and competition may not be valuing the fixed capital tied up in the Mining, Utilities, Manufacturing, and Transportation and Warehousing industries. However, it may not be the case that competition is failing to equalize the profit rate. The transfers of surplus value across industries could be a reflection of competition between more industrial-oriented capitalists and finance-oriented capitalists.[16]

Glick (1985), Semmler (1981, 1984), and Shaikh (2008) also find empirical support for the tendency of profit rates to equalize across industries. Glick (1985) and Semmler (1981) find that there is a tendency for a long-run equalization of profit rates across industries. Semmler (1984) extends this analysis to find that there is evidence of increased capital mobility over time and that pricing practices are consistent with prices of production in the long run. Shaikh (2008) presents a strong case for the equalization of incremental profit rates (the rate of return on new investment) across U.S. manufacturing industries at a fairly dis-aggregated level.[17] The incremental rate of return is the ratio of changes in total profits to new investment, which is meant to serve as a proxy for the traditional rate of profit that is typically expressed as the ratio of money surplus value to the total capital stock: $r = S/K$.

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analysis is not as detailed as that of Duménil and Lévy (1999, 2002).

[16]Although it is possible for capitalists to bridge industrial and finance sectors in order to have their hands in both industries.

[17]Tsoulfidis and Tsaliki (2005) apply a similar analysis to Greek manufacturing with similar results.

Shaikh (2008) believes that the incremental rate is the relevant rate to consider because he asserts that capital mobility decisions are guided by the returns on new investment as opposed to returns on older vintages of capital. Duménil and Lévy (2012) find the use of the incremental rate questionable, but the details of the debate over the incremental rate of return and traditional profit rate measures are beyond the scope of this paper.

In light of earlier uneven support for profit rate equalization, recent work by Scharfenaker and Semieniuk (2017) uses a new dataset to provide compelling evidence for profit rate equalization. Using data on over 24,000 North American firms over the period 1962-2014 Scharfenaker and Semieniuk (2017) find that firm profit rates closely fit a stable, strongly peaked Laplace distribution. The type of movements in surplus value shown in Section 4 can be seen as part of what takes place to tendentially equalize the profit rate, while also bringing to light the issue of transfers of surplus value to unproductive industries. The aim of the results is not to settle open questions about profit rate equalization, which are beyond the current scope, but to provide some indication as to what might be happening over the course of capitalist competition over shares of surplus value.

5.2   Unproductive Labor and Instability

The figures in Section 4 also align with recent empirical work featuring a distinction between productive and unproductive labor. Moseley (1985, 1988, 1990, 1991, 1994) presents an empirical account of the increase of unproductive labor in the total share of employment contributing to declines in the profit share and profit rate in the U.S., creating an overall drag on the economy. This is reinforced by Paitaridis and Tsoulfidis (2012) who arrive at a comparable conclusion that unproductive labor can contribute to a drag on capital accumulation. Similarly, Basu and Foley (2013) and Foley (2011b) show that a concept of unproductive labor can be used to more accurately estimate 'measured value added' for the U.S. and provide part of an explanation for how changes in employment no longer closely track fluctuations in real GDP. Similar to Moseley, Basu and Foley's findings indicate that increases in unproductive employment may contribute to recent changes in the pattern of accumulation for the U.S.

The increase in the amount of surplus value transferred to unproductive industries in Figure 11 partly reflects increases in unproductive labor but also captures potential increases in surplus value realized as profit in these industries. Thus, it may not only be increases in unproductive labor that can create a drag on the economy. Increases in profit realized by unproductive industries reflect a transfer of surplus value from productive industries that could potentially detract from funds available for investment in productive industries. Higher profits in unproductive industries, especially the FIRE industry, could also be used to expand speculative activities that garner future profit for FIRE industries but do not directly contribute to commodity production. As Foley (2013) discusses, a primary aim of speculative activities in financial markets is to establish greater claims on shares of surplus value produced elsewhere in the circuit of capital. Changes in the strength of these claims can be seen in the fluctuations in Figure 12.

Mohun (2013, 2014) arrives at a similar conclusion for the insights of unproductive labor. Mohun (2002, 2005, 2006, 2013, 2014) adopts a notion of unproductive labor along class lines rather according to the type of activity undertaken. This draws from Marx's assertion

that the labor of capitalists is inherently unproductive since it does not directly contribute to commodity production. It is then possible to classify labor as productive or unproductive based on whether a worker is non-supervisory or a supervisor, with the supervisory work of managers and capitalists being paid for out of surplus value. This approach, while distinct from the current one, shares some similarities by classifying certain industries like the FIRE industry as unproductive. Emphasizing the importance of class, Mohun finds that a concept of unproductive labor drawn along class lines is necessary for a compelling Marxian theory of capitalist accumulation (Mohun 2002) and the concept can help to explain how surplus value can be channeled into speculative activities and potentially contribute to crises (Mohun 2013).

This potential is reflected in the pattern of surplus value transfers in Figure 12 where changes in the ability of financial institutions to realize surplus value could alter the degree of speculative activity undertaken. If financial institutions are able to realize large amounts of surplus value then they will be able to expand speculative activities and possibly contribute to instability in the economy, just as a decline in the amount of surplus value these institutions are able to realize could prevent financial markets from provisioning the liquidity needed to maintain growth of commodity production and accumulation.

The current results affirm the insights of other contributions, namely that unproductive activities can present problems for economic stability. Section 4 does not necessarily show that increases in unproductive employment itself creates a drag accumulation, but it does show that changes in the competitive relationship between productive and unproductive industries can impact growth. Indeed, the current results go a step beyond Moseley's analyses by showing how transfers of surplus value between productive and unproductive industries may contribute to instability.

The results do not directly address Mohun's emphasis on the importance of class. However, consideration of unproductive labor along class lines (in addition treating certain industries as unproductive) would not greatly impact the analysis of trends in transfers of surplus value (as shown in Figures 11 and 12). Taking class into account would treat more workers as unproductive and likely accentuate any transfers of surplus value taking place between what is considered productive and unproductive. The intention is not to discount the importance of class, but to emphasize how the distinction between productive and unproductive may be a dominant factor when analyzing competition among capitalists.

5.2.1   Is a Concept of Unproductive Labor Necessary?

Just as there is more than one way to consider unproductive labor, there is not necessarily agreement on whether the concept of unproductive labor is useful. Houston (1997) and Laibman (1992, 1993, 1999), for example, advocate abandoning a concept of unproductive labor. Laibman does not see an adequate way to distinguish between the phases of production and circulation that would allow for easy classification of productive and unproductive labor while retaining a clear conceptual definition of e. Houston (1997, 133-135) claims that labor involved in changing the form of value itself produces value, therefore all workers should be considered productive. This would mean, for instance, that activities in the FIRE industry and Wholesale and Retail Trade would be considered productive. If all workers are considered productive then e is the same as a standard profit-wage ratio and consideration of surplus

value production and realization would be limited to analyzing the competition that equalizes the profit rate.

The analyses by Moseley, Paitaridis and Tsoulfidis, Mohun, and Basu and Foley, present cases for the usefulness of a concept of unproductive labor. Similarly, Mohun (1996) provides a compelling account of how unproductive labor fits into Marx's theory of value, which is only partially captured in Section 2.2. The discussion in Section 2.2 and results of Section 4 support previous conclusions as to the role of unproductive labor in capitalist economies, while further developing an account of the disconnect between surplus value production and realization that can contribute to economic instability. There may be theoretical or political objections to a notion of unproductive labor but without such a concept a great deal of Marxian analyses would lose their distinctive features, and Marx's theory of surplus value would not hold the same meaning empirically. Thus, the concept of unproductive labor is worth careful consideration.

6   Conclusions & Further Work

This paper presents a framework for understanding the disconnect between surplus value production and realization that highlights transfers of surplus value across productive and unproductive activities in capitalist economies. The framework allows the imputation of surplus value production at the industry level and easy comparison to surplus value realization. The potential gaps in surplus value realization that productive industries experience explains the source of revenue for unproductive industries. Specifically, the revenue of unproductive industries is the result of surplus value transfers from productive industries. The empirical estimations of surplus value production and their comparison to surplus value realization show that gaps exist for productive industries and unproductive industries realize large portions of total surplus value via transfers from productive industries. Changes in the patterns of these transfers could point to potential points of instability in the circuit of capital.

Overall, the results align with recent work that incorporates a concept of unproductive labor. There are important differences between the current approach and others, but there is resonance across approaches in the basic insight that unproductive labor can explain how part of capitalist competition takes shape and how it can help to explain recent trends in the U.S. economy. If unproductive labor can act as a drag on the economy, and increases in revenue for unproductive industries reflect redistributions of surplus value, a natural question is: 'how much redistribution of surplus value is too much for the economy to remain stable?'

This is not an easy question to answer, but it becomes all the more pressing in the presence of looming resource constraints and what appears to be a prolonged difficulty in increasing the rate of surplus value after the recent crisis. It may not be unreasonable to think along the lines that stability of the capitalist world economy depends on the health of transfers of surplus value within the circuit of capital. The problem then becomes how to keep surplus value production growing fast enough to maintain the transfers of surplus value required by the unproductive service industries. Continuous growth of surplus value production of this kind would require continued growth of productive industries with no limit. This may not be possible given the growth limitations posed by climate change and resource constraints.

As this paper has shown, the surplus value imputation method allows one to trace out

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the transfers of surplus value taking place across its production and realization, pointing to surplus value transfers as a potential point of instability in the circuit of capital. Carefully tracing out the ways that this instability could manifest in the circuit requires further exploration and this paper does not provide answers to all of the questions around instability raised here, but it does provide a helpful set of tools for further exploration.

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A   Appendix A

This appendix explains the equivalence of the value and money rate of surplus value in the New Interpretation (Duménil 1980, 1984; Foley 1982, 1986). This explanation is juxtaposed with what Foley (2000) calls the 'dual-system' approach to Marx.

Let n be the number of commodities with a single production process and commodity for each industry $i = 1, \ldots, n$. Let p denote the $1 \times n$ vector of prices, let l be the $1 \times n$ vector of labor requirements for production, let A denote the $n \times n$ matrix of capital requirements, and let I denote the n-dimensional identity matrix. The $n \times 1$ vector x represents the gross product and the $n \times 1$ vector $y = (I - A)x$ represents net product. With the money wage given by w, the money rate of surplus value e can be written as:

$$e = \frac{py - wlx}{wlx} = \frac{p(I - A)x - wlx}{wlx}. \tag{14}$$

Following the New Interpretation, the monetary expression of labor time (MELT) can be used to convert between magnitudes measured in money and units of labor time. Letting μ denote the MELT, the value rate of surplus value e_v is written as

$$e_v = \frac{(p(I - A)x - wlx)/\mu}{wlx/\mu}. \tag{15}$$

Note that equations (14) and (15) are equivalent $e \equiv e_v$, thus the money rate of surplus value is the same as the value rate of surplus value. This result matches Marx's (1981, 241-242, 275) assumptions in his presentation of the transformation of values into prices of production, and this result holds only in the New Interpretation (Cogliano 2013).

In what Foley (2000) calls the 'dual-system' approach to Marx, the money rate of surplus value and the value rate of surplus value do not necessarily need to match. Let the $1 \times n$ vector λ represent the standard dual-system embodied labor values, with $\lambda = l(I - A)^{-1}$, and let b denote the $n \times 1$ subsistence bundle of workers. In this approach, the value rate of surplus value e_λ is written as:

$$e_\lambda = \frac{\lambda(I - A - bl)x}{\lambda blx}. \tag{16}$$

The price rate of surplus value is given in equation (14).

Equations (14) and (16) are equivalent if $p = \phi\lambda$ for some scalar $\phi > 0$. If prices p are prices of production $p = (1 + r)(pA + wl)$ with a uniform profit rate r, then if $r = 0$, $p = \phi\lambda$. However, for any $r > 0$, $p \neq \phi\lambda$. Equations (14) and (16) can also be equal if the organic compositions of capital are equal across industries. Letting $A_{\star j}$ denote any column of the A matrix, if $A_{\star j}/l_j$ are equal across all $j = 1, \ldots, n$, then $p = \phi\lambda$ and $e \equiv e_\lambda$.

The cases of $r = 0$ and/or a uniform composition of capital are unrealistic for capitalist economies, thus $p \neq \phi\lambda$ in general—as has been shown in the vast literature on the transformation problem. The main conclusion of this appendix is that, in general, the money and value rates of surplus value can be shown to be equal only in the New Interpretation.

B   Appendix B

The data used for the imputation of surplus value in Section 3 comes from two sources:

1. The Gross Domestic Product (GDP) by Industry Data from the Bureau of Economic Analysis available at:
   http://bea.gov/industry/gdpbyind_data.htm.

2. The Employment, Hours, and Earnings - National database from the Bureau of Labor Statistics available at: http://bls.gov/data/

The GDPbyInd_VA_1947-2016 sheets from the GDP by Industry data, which contain data on value added by industry (according to NAICS classification) and the components of value added by industry, are used to impute industry level surplus value production. At the time that the calculations were done the data on the components of value added (compensation of employees, wages and salaries, taxes on production and imports, subsidies, and gross operating surplus) was consistently available from 1987 to 2015.

Various steps of surplus value imputation require a distinction between productive and unproductive labor. This distinction is made at the two-digit NAICS level with some aggregated industries in Sections 3 and 4 containing multiple two-digit NAICS industries. The list of industries grouped according to their classification as productive or unproductive with NAICS codes in parentheses is as follows:

Productive: Agriculture, Forestry, Fishing, and Hunting (11); Mining (21); Utilities (22); Construction (23); Manufacturing (31, 32, 33); Transportation and Warehousing (48, 49); Information (51); Administrative and Waste Management Services (56); Arts, Entertainment, Recreation, Accommodation, and Food Services (71, 72).

Unproductive: Finance, Insurance, Real Estate, Rental, and Leasing (52, 53); Professional and Business Services (54, 55); Education Services, Health Care, and Social Assistance (61, 62); Other Services Except Government (81); Wholesale Trade (42); Retail Trade (44, 45).

The data used from the Employment, Hours, and Earnings - National database consists of estimates of average weekly hours worked for the above listed industries, total employees, and total non-farm employment.

C   Appendix C

C.1   Rates of Surplus Value Over the Business Cycle

As previously discussed, it is possible assume that e equalizes at different frequencies when imputing surplus value production at the industry level. Sections 3 and 4 assume that e equalizes annually. An alternative would be to assume that e equalizes over business cycles. Using NBER recessions approximated to the nearest year, the average e from one peak in the business cycle to the next can be found. These peak-to-peak e (within the available data) are shown below in Figure 13. The peak-to-peak e can be used in place of annual e to

impute the surplus value production by industry according to equation (12). The imputed surplus value production is restated as percentages of total surplus value production over the time series from 1987-2015 and compared to realization over the same horizon in Figure 14. Figure 15 shows surplus value production versus realization for productive industries from 1987-2015. Since only surplus value production changes with a different assumption about e the data on surplus value realized remains unchanged from Figures 5, 7, and 8. Hence, a figure for surplus value realization by unproductive industries is not shown for this exercise. Overall, the results of this alternative assumption about e do not substantially differ from those arrived at through assuming e equalizes annually.

Figure 13: Rate of Surplus Value, Peak-to-Peak e, & Profit-Wage Ratio for the U.S. 1987-2015
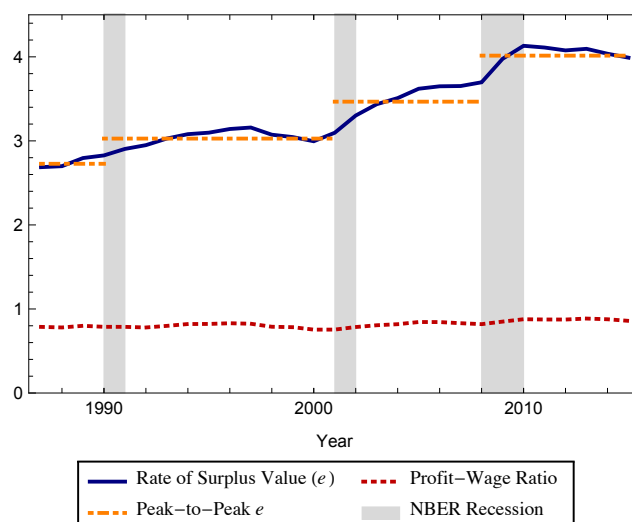

Figure 14: Total Surplus Value Produced vs. Total Surplus Value Realized 1987-2015 (Peak-to-Peak RSV)
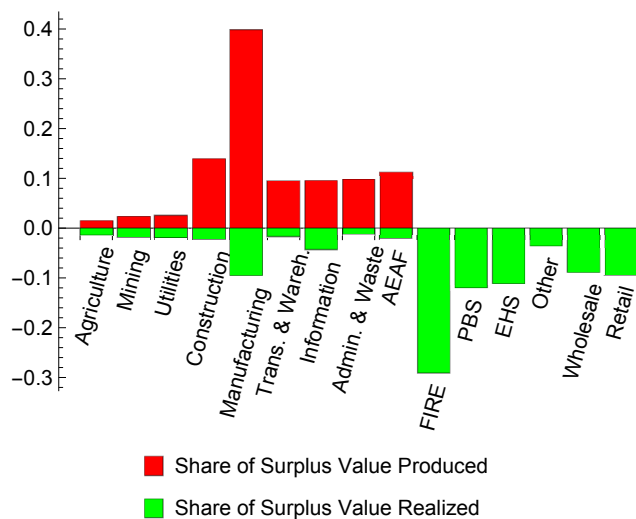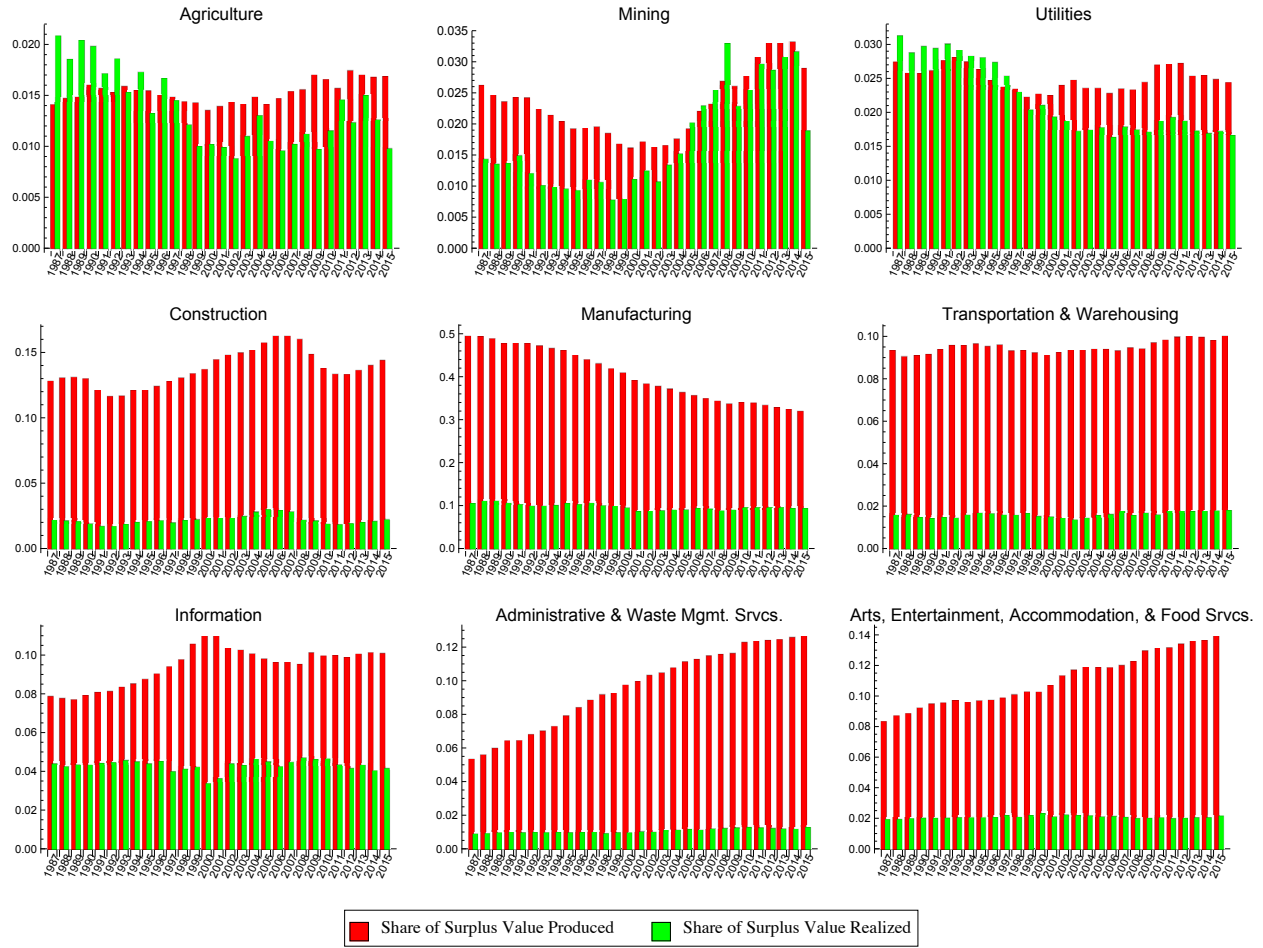
Figure 15: Percent of Total Surplus Value Produced vs. Percent of Total Surplus Value Realized 1987-2015 (Peak-to-Peak RSV)

C.2 Four-year Moving Average Rates of Surplus Value

Another possibility for imputing surplus value production at the industry level is to use moving averages of e. A four-year moving average of e is shown in comparison to the annual e in Figure 16. The surplus value imputation from in equation (12) is done using the four-year moving average e and shown below in Figures 17 and 18. The four-year moving average e is a shorter time series than the annual e, thus the imputation of surplus value cannot be performed for all years in the data. For this exercise the time period is restricted to 1989-2014. Figure 17 shows total surplus value production by industry for 1989-2014 and compares this to total surplus value realization. Figure 18 shows surplus value production versus realization by productive industries in each year from 1989-2014. Because surplus value realized by unproductive industries remains unchanged from Figures 5, 7, and 8, this chart is omitted here. Using a different assumption about the frequency of the equalization of e does not make much difference to the overall picture of surplus value production and realization, or which industries are net producers of surplus value versus net realizers.

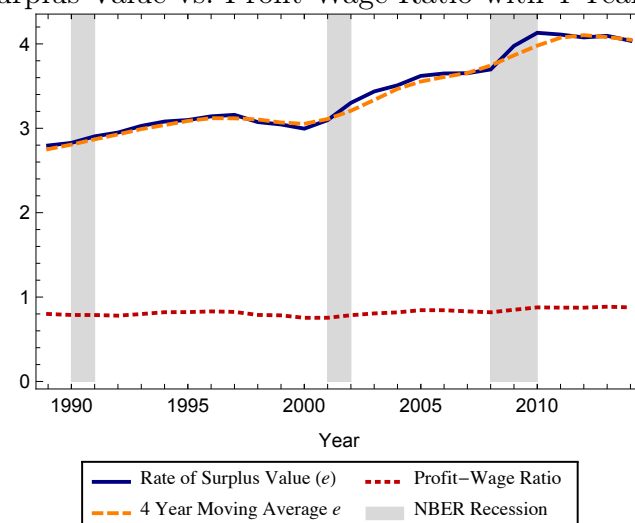Figure 16: Rate of Surplus Value vs. Profit-Wage Ratio with 4 Year Moving Average RSV

Figure 17: Total Surplus Value Produced vs. Total Surplus Value Realized 1989-2014 (4 Year Moving Average RSV)
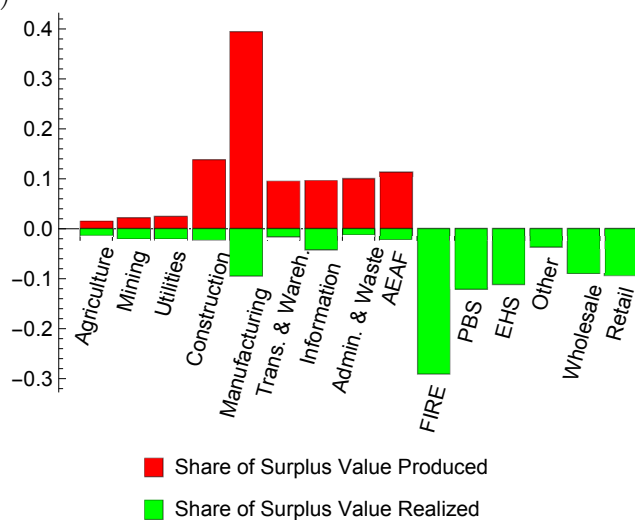
Figure 18: Percent of Total Surplus Value Produced vs. Percent of Total Surplus Value Realized 1989-2014 (4 Year Moving Average RSV)