Product Market Regulation and Market Work: A Benchmark Analysis

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# Background/Motivation

Hours Worked Relative to US in 2003

<table>
<thead>
<tr>
<th>H &lt; .75</th>
<th>.75 &lt; H &lt; .85</th>
<th>.85 &lt; H &lt; .95</th>
<th>H &gt; .95</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>Austria</td>
<td>Denmark</td>
<td>Australia</td>
</tr>
<tr>
<td>France</td>
<td>Finland</td>
<td>Greece</td>
<td>Canada</td>
</tr>
<tr>
<td>Germany</td>
<td>Ireland</td>
<td>Portugal</td>
<td>Japan</td>
</tr>
<tr>
<td>Italy</td>
<td>Netherlands</td>
<td>Sweden</td>
<td>New Zealand</td>
</tr>
<tr>
<td></td>
<td>Norway</td>
<td>UK</td>
<td>Switzerland</td>
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</tbody>
</table>
Accounting for Differences in Hours of Work

Differences in hours worked may arise due to differences in various factors:

Primitives
  e.g., preferences

Policies
  e.g., various tax and transfer programs, labor and product market regulation

Institutions
  e.g., unions
Recent Literature on Product Market Regulation

**Empirical**
Bertrand and Kramarz (2002)
Nicoletti and Scarpetta (2003...)

**Theoretical**
Blanchard and Giavazzi (2002)

**Quantitative**
Ebell and Haefke (2004, 2006)
Messina (2006)
Objective

To examine the mechanics through which product market regulations impact on hours of work in a benchmark model of time allocation.
Main Findings

1. The mechanics through which product market regulations impact on hours of work are effectively the same as those through which taxes on labor income impact on hours of market work. Specifically:
   - key driving force is the magnitude of transfers induced by each policy
   - key propagation mechanism is determined by the elasticity of labor supply

2. Examining sector specific regulation and sectoral hours of work provides no information about the aggregate effects of product market regulations.
Unemployment vs Hours Worked

Unemployment Rates 2003

<table>
<thead>
<tr>
<th>Belgium</th>
<th>France</th>
<th>Germany</th>
<th>Italy</th>
<th>US</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.3</td>
<td>9.8</td>
<td>9.3</td>
<td>8.8</td>
<td>6.0</td>
</tr>
</tbody>
</table>

**Question:**

What is the relationship between these differences in unemployment rates and the previously shown differences in hours worked?
<table>
<thead>
<tr>
<th></th>
<th>Belgium</th>
<th>France</th>
<th>Germany</th>
<th>Italy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative $H/W$</td>
<td>.86</td>
<td>.77</td>
<td>.80</td>
<td>.87</td>
</tr>
<tr>
<td>Relative $ER$</td>
<td>.83</td>
<td>.88</td>
<td>.91</td>
<td>.79</td>
</tr>
<tr>
<td>Relative $H$</td>
<td>.71</td>
<td>.68</td>
<td>.73</td>
<td>.69</td>
</tr>
<tr>
<td>$\Delta ER$</td>
<td>.12</td>
<td>.09</td>
<td>.06</td>
<td>.16</td>
</tr>
<tr>
<td>$\Delta UR$</td>
<td>.053</td>
<td>.038</td>
<td>.033</td>
<td>.028</td>
</tr>
<tr>
<td>$\Delta UR \rightarrow \Delta ER$</td>
<td>.035</td>
<td>.038</td>
<td>.033</td>
<td>.028</td>
</tr>
<tr>
<td>Relative $H^M$</td>
<td>.76</td>
<td>.71</td>
<td>.76</td>
<td>.71</td>
</tr>
</tbody>
</table>
Conclusion

• From a pure accounting perspective, differences in unemployment are relatively unimportant in terms of thinking about differences in hours of work.

• It follows that models which only attempt to account for differences in unemployment rates reveal little information about what accounts for differences in hours worked.
Some additional aspects of differences in hours of work that may prove helpful in assessing the relative importance of various factors:

1. Time series evolution
2. Sectoral Patterns
3. Age Patterns
4. Intensive and Extensive Margins
5. Productivity
Time Series Evolution

[Graph showing the evolution of hours relative to US for Belgium, France, Germany, and Italy from 1955 to 2005.]
Sectoral Patterns

Sectoral Employments: Continental Europe vs. US

Year | Employment Rate
--- | ---
1960 | 1.55
1970 | 1.40
1980 | 1.25
1990 | 1.10
2000 | 1.00

Legend:
- **Ag+Ind**
- **Services**
Age Patterns

Employment Rate by Age Relative to US 2000

Year

Employment Rate Relative to US

France
Germany
Belgium
Italy
Extensive Margin

![Graph showing ER Relative to US for Belgium, France, Germany, and Italy from 1950 to 2010.](image)
Intensive Margin

![Graph showing hours/worker relative to the US from 1955 to 2005 across different countries: Belgium, France, Germany, Italy. The y-axis represents hours/worker relative to the US, ranging from 0.75 to 1.2, and the x-axis represents years from 1955 to 2005.]}
Productivity

[Graph showing productivity trends for Belgium, France, and Italy from 1960 to 2000. The graph plots relative output per hour against year.]
Standard Model of Aggregate Labor Supply

- There is a single representative household
- Preferences are given by:
  \[ u(c, 1 - h) = \alpha \log c + (1 - \alpha) \frac{(1 - h)^{1-\gamma} - 1}{1 - \gamma} \]
- Technology is given by a constant returns to scale production function that uses only labor:
  \[ c = h \]
Extension

- The final good ($c$) is produced by using intermediate goods according to the CES production function:

$$c = \left[ \int_0^N y(i)^\rho \, di \right]^{1/\rho}$$

where $[0, N]$ is the set of intermediate goods available.

- Each intermediate is produced via a linear production function that uses only labor:

$$y(i) = h(i)$$

- There is a fixed set-up cost of $\phi$ units of time to operate each of these technologies.

- Each point in $[0, \infty)$ represents a potential intermediate product.
Efficient Allocation

Let $N$ be the number of intermediates and $y$ be the output per intermediate. The Social planner seeks to maximize

$$\alpha \log([Ny^\rho]^{1/\rho}) + (1 - \alpha) \frac{(1 - h)^{1-\gamma} - 1}{1 - \gamma}$$

s.t.

$$h = N(y + \phi)$$

Solution is given by:

$$\frac{1 - \alpha}{\alpha} \frac{h}{(1 - h)^\gamma} = \frac{1}{\rho}$$

$$y = \frac{\rho}{1 - \rho} \phi$$

$$N = \frac{h}{y + \phi}$$
Decentralized Equilibrium Allocation

Normalize the price of the final good to be 1, let $w$ be the wage rate and $p$ be the price of an intermediate good. Consumer problem is:

$$\max \alpha \log(c) + (1 - \alpha) \frac{(1 - h)^{1-\gamma} - 1}{1 - \gamma}$$

s.t.

$$c = wh$$

Solution implies:

$$\frac{1 - \alpha}{\alpha} \frac{h}{(1 - h)^\gamma} = 1$$

So, $h$ is lower than in the efficient allocation.
Demand from final good producer implies that optimal pricing rule for intermediate goods producers is a simple markup rule over marginal cost:

\[ p = \frac{w}{\rho} \]

Zero profit for intermediate producers implies:

\[(p - w)y = w\phi\]

which implies:

\[ y = \frac{\rho}{1 - \rho} \phi \]

It follows that solution for \( y \) is the same as in the efficient allocation.
Labor market clearing implies:

\[ N = \frac{h}{y + \phi} \]

Summary
Relative to the efficient allocation, the decentralized equilibrium has \( h \) too low and \( N \) too low, but the level of \( y \) is the same as in the efficient allocation.
Analysis of Labor Taxes

I assume a proportional tax $\tau$ on all labor income and consider two cases:

**Case 1:** All tax revenues are rebated lump sum to the representative household

**Case 2:** All tax revenues are used to purchase the final good which is then discarded.
Implications for hours of work can be deduced by simply examining the consumer’s maximization problem:

\[
\text{max } \alpha \log(c) + (1 - \alpha) \frac{(1 - h)^{1 - \gamma} - 1}{1 - \gamma}
\]

s.t.

\[
c = (1 - \tau)wh + T
\]

in conjunction with the government budget constraint. FOC is:

\[
\frac{\alpha w (1 - \tau)}{(1 - \tau)wh + T} = \frac{(1 - \alpha)}{(1 - h)^\gamma}
\]
Case 1: If $T = 0$ then this gives
\[
\frac{(1 - \alpha)}{\alpha} \frac{h}{(1 - h)^\gamma} = 1
\]

Case 2: If $T = (1 - \tau)wh$ then this gives:
\[
\frac{(1 - \alpha)}{\alpha} \frac{h}{(1 - h)^\gamma} = 1 - \tau
\]

Note: If we had taxed consumption instead of labor then this condition would have been:
\[
\frac{(1 - \alpha)}{\alpha} \frac{h}{(1 - h)^\gamma} = \frac{1}{(1 + \tau)}
\]
Key Messages About Taxes and Hours of Work

Three things matter:

• size of the tax
• what is done with tax revenue
• labor supply elasticity
Analysis of Product Market Regulations

We study one particular aspect of product market regulations—increases in entry costs. We study four cases:

Case 1: Entry costs represent real resource costs
Case 2: Entry costs represent nominal costs but are used to purchase consumption good and then discarded
Case 3: Entry costs represent nominal costs that are rebated to consumers
Case 4: Entry is restricted exogenously and entrants earn positive profits
Case 1: Real Resource Costs

Assume that due to regulations the set up cost increases from $\phi$ to $\phi + \kappa$

**Results:**

We can read this directly from our earlier solution by simply changing the value of $\phi$. In particular we see that:

- $h$ is unchanged
- $y$ increases
- $N$ decreases

Bottom line: Allocations (and welfare) change, but $h$ is unaffected.
Case 2: Nominal Entry Cost That is Discarded

- Consumer maximization problem implies that expression for equilibrium $h$ does not change.
- Zero profit condition implies that $y$ increases.
- Labor market clearing implies that $N$ decreases.
- $c$ is less than total output because government throws away some output.

Bottom line: Allocations and welfare are affected, but $h$ stays the same.
Case 3: Nominal Cost, Rebated to Households

FOC for $h$ is:

$$\frac{(1-\alpha)}{\alpha} \frac{wh + T}{(1-h)^{\gamma}} = w$$

where

$$T = wN\kappa$$

Using labor market clearing condition to solve for $N$ this becomes:

$$T = \frac{(1-\rho)\kappa}{\phi + \rho\kappa} wh$$

Substituting into first equation gives:

$$\frac{(1-\alpha)}{\alpha} \frac{h}{(1-h)^{\gamma}} = \frac{1}{1 + \frac{(1-\rho)\kappa/\phi}{1+\rho\kappa/\phi}}$$
But more revealing expression is to rearrange FOC to get:

\[
\frac{(1 - \alpha)}{\alpha} \frac{h}{(1 - h)^\gamma} = \frac{1}{1 + \frac{T}{wh}}
\]

Compare this to expression for \( h \) in the presence of a consumption tax:

\[
\frac{(1 - \alpha)}{\alpha} \frac{h}{(1 - h)^\gamma} = \frac{1}{1 + \tau}
\]

In both cases \( T/wh \) and \( \tau \) have the same interpretation: they are the amount of the transfer relative to labor income.
A Simple Quantitative Point
Many papers refer to work by Djankov et al (2002) which provides estimates of entry barriers due to regulation.

Their estimates suggest that entry barriers due to regulation are roughly an order of magnitude larger in continental Europe than in the US.

Two cautions about using these numbers to infer something about implied labor market differences:

1. These numbers represent time costs and hence are real resource costs
2. Previous result tells us that what matters is not just $\kappa$ but $\kappa/\phi$
Simple Numerical Example

Set $\phi = 1$ and $\rho = .8$.

Let $\kappa = .01$ in the US, implying that dealing with regulatory barriers represents 1% of set-up costs in the US.

Suppose that $\kappa$ is ten times larger in Europe, i.e., $\kappa = .1$, and that costs are rebated.

Relative values of driving forces in the two economies is equal to 1.0165 which means that this cost is equivalent to a 2% labor tax with rebate. With $\kappa = .1$ in US and 1 in Europe, equivalent tax rate is 9%. 


Case 4: Restricted Entry

In this case there are profits, so consumer’s budget equation reads:

$$c = wh + \pi$$

so that consumer FOC is:

$$\frac{(1 - \alpha)}{\alpha} \frac{wh + \pi}{(1 - h)^\gamma} = w$$

Same rearrangement as before yields:

$$\frac{(1 - \alpha)}{\alpha} \frac{h}{(1 - h)^\gamma} = \frac{1}{1 + \frac{\pi}{wh}}$$

Conclusion is the same as before.
Summary

Previous results show a strong similarity between the effects of taxes and the effects of product market regulation. Specifically:

- If there are no transfers then there is no effect on hours of work
- If there are transfers, then key forcing variable is the size of the transfers relative to labor income
- Key determinant of propagation is the labor supply elasticity

As an empirical matter, it seems that differences in transfers induced by taxes are much larger than those induced by regulations. This suggests that labor taxes are likely to be much more important than product market regulations in accounting for differences in hours worked.
Extensions

1. Endogenous markups: assume $\rho = \rho(N)$

2. Imperfect competition in labor market: assume heterogeneous labor and let households behave as wage setters

3. Multi-sector model: assume two sectors with regulation only in one sector
Results from Extensions

1. Endogenous markups: implications for $h$ are unchanged, though effect on other components of allocations are affected.

2. Imperfect competition in labor market: Imperfect competition influences $h$ but given imperfect competition there is no change in the results on how product market regulation influences $h$.

3. Two sector analysis: Results for total $h$ are unchanged, but product market regulations can affect relative hours across sectors. This change may be positive or negative depending upon elasticity of substitution between the outputs of the two sectors.
Conclusions

1. The mechanics through which product market regulations impact on hours of work are effectively the same as those through which taxes on labor income impact on hours of market work. Specifically:
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